3.0 ENVIRONMENTAL SETTING

1. Chapter 3.0 summarizes the current environmental setting parameters at the site. Each parameter is discussed in detail in the following sections:

   - 3.1 - Location and Land Use
   - 3.2 - Local Ecology
   - 3.3 - Topography and Surface Drainage, and Surface Water Hydrology
   - 3.4 - Climate
   - 3.5 - Surface Water Hydrology
   - 3.6 - Geology
   - 3.7 - Hydrogeology
   - 3.8 - Surrounding Area Contamination

   Further details are contained in the 1999 Current Conditions Report (ARCADIS G&M, 1999a).

3.1 LOCATION AND LAND USE

1. The site is located at 19200 S. Western Avenue on the border between the City of Torrance and the City of Los Angeles, within Los Angeles County, California (see Figure 1.1). The United States Census Bureau divides Los Angeles County into two sections, the first containing the Los Angeles metropolitan area and the incorporated City of Long Beach, and the second containing the remaining portions of Los Angeles County. The former section covers 4,060 square miles and contains the former ILM facility. The population of this area is 8,863,164 people with a median age of 30.6 years. The population density is 2,183 people per square mile.

2. The site is currently zoned M2. This designation is for light industrial uses, including limited commercial and manufacturing uses, clinics, limited machine shops, animal hospitals and kennels, industrial uses, mortuaries, agriculture, storage yards of all kinds and animal keeping. Land zoned M2 cannot be used for residential dwellings of any kind, hospitals, schools or churches.

3.2 LOCAL ECOLOGY

1. A scoping level ecological assessment was conducted as part of the soil *Baseline Risk Assessment*, Lockheed Martin Corporation, International Light Metals Facility, dated March 22, 1996b (Geraghty & Miller, 1996b) (BRA), which was specific to the

nonoperational ILM manufacturing facility. The conclusions presented in the BRA are valid for the recent redevelopment of the property into three large distribution/ warehousing buildings.

2. The scoping level ecological assessment indicated that the conditions at the site provide a very minimal habitat for wildlife. There is no aquatic habitat at the site; surface water occurs intermittently in the storm drain system only in association with precipitation events. A limited number of avian, terrestrial plant and terrestrial insect species were observed at the former ILM facility during a field survey. No special species were identified onsite or in the surrounding area. The potential for adverse effects to mobile receptors that may access the site is considered low as reported previously in the BRA.

3. The evaluation of data collected for the ecological assessment indicated that the overall potential for ecological impacts is low, and the relatively barren habitat at the site does not present a significant utilization area for wildlife.

3.3 TOPOGRAPHY AND SURFACE DRAINAGE

1. The former ILM facility, located on the border of Torrance and the City of Los Angeles, is entirely located within the Torrance Plain, a physiographic feature of the Coastal Plain of Los Angeles County.

2. The Coastal Plain of Los Angeles County encompasses an area of 480 square miles and is bounded by the Santa Monica Mountains to the north, the low-lying Elysian, Repetto, Merced and Puente Hills on the northeast, the Coyote Creek to the east, and the Pacific Ocean to the south and west. The Coastal Plain slopes gently from the bordering highlands on the north and northeast toward the ocean (State of California Department of Water Resources [DWR] Bulleton 104: Appendix A, 1961 [DWR, 1961]).

3. The Torrance Plain is a relatively broad, featureless area, slightly dissected by local streams and channels, and is bounded to the south by the Palos Verdes Hills, to the west by the El Segundo Sand Hills, to the north by the Ballona Gap, and to east by the Rosecrans and Dominguez hills (DWR, 1961). Streams and channels within the Torrance Plain enter from the north and flow in a southeasterly direction.

4. The approximate average elevation at the site is 55 feet above mean sea level.

5. The Dominguez Channel, located approximately 1 mile north and 1.5 miles east of the site, is the major surface water drainage channel in the area. The Dominguez Channel directs surface water flow to the southeast and south, and discharges to the Pacific Ocean at the Los Angeles Harbor in San Pedro, approximately 6.5 miles south-southeast of the site.

3.4 CLIMATE

1. Climatological data was collected and reviewed from past reports regarding general weather patterns, average rainfall, wind direction and relative humidity in the vicinity of the former ILM facility. The site is located in the California South Coast Air Basin, which is subject to two seasons: a rainy season and a dry season. The rainy season is normally from late fall to early spring, and the dry season is from the late spring through the early fall. The average yearly rainfall is approximately 14 inches, with a recorded yearly minimum of approximately 4 inches and a reported maximum of approximately 32 inches. The average relative humidity for this region is 71 percent. The average annual temperature in the Torrance area is approximately 61 degrees Fahrenheit (° F) with an average minimum of 51° F, and average maximum of 71° F.

2. The wind pattern and direction in this area are dependent on the time of day and time of year. During the dry season (late spring through early fall), wind flow follows a specific pattern. Daytime wind flow is a sea breeze, flowing from the ocean toward land (from the west). In the evening, wind direction reverses and flows from land toward the ocean (from the east). During the late fall to early spring, wind direction is generally from the northwest. This pattern is altered 5 to 10 days each year, when strong "Santa Ana" winds blow from the east toward the ocean.

3.5 SURFACE WATER HYDROLOGY

1. The former ILM property does not lie within a 100-year flood plain area, nor does any area within 1,000 feet of the property boundary. Across a majority of the site, the land surface is relatively flat. Near the southeast corner of the facility, local topographic relief is at a maximum value of approximately 10 feet.

2. In general, drainage from the south-central portion of the Torrance Plain is toward a local downwarp, southwest of Dominguez Hill, by way of the former Laguna Dominguez (currently Victoria Park) and a small unnamed creek which trends eastward from Los Angeles

(Geraghty & Miller, 1996b). This disconnected drainage pattern has been artificially integrated by the Dominguez Channel. The Dominguez Channel is a concrete-lined drainage canal which captures a majority of the run-off within the Torrance Plain including run-off from the former ILM facility site. The Dominguez Channel extends from Alondra Park southeast toward Victoria Park and continues to a point of discharge into San Pedro Bay (Geraghty & Miller, 1996b).

3. The Dominguez Channel, located approximately 1 mile north and 1.5 miles east of the former ILM facility, is the major surface water drainage channel in the area. The Regional Water Quality Control Board (RWQCB) has designated the Dominguez Channel as having existing beneficial uses for noncontact recreational uses and uses of water that support habitats necessary for the survival and maintenance of rare, endangered or threatened plant or animal species. Human access to the water is currently prohibited by the Los Angeles County Department of Water and Power (Geraghty & Miller, 1996b).

4. The stormwater system currently in use at the site includes approximately 30 stormwater catch basins located throughout the parking and loading areas of the site. Stormwater is directed along slight (approximately 1 percent) grades across paved areas into the catch basins, with the exception of the undeveloped portion of the site. Stormwater flowing into the catch basins is directed via subsurface piping to the municipal stormwater system (Fremont Associates, Inc./ Hill Pinkert Architects Building Plan, August 1999). The current operations at the site do not warrant a need for stormwater discharge permits.

3.6 GEOLOGY

1. The generalized stratigraphy beneath the Torrance area includes a deep basement of Mesozoic metamorphic rocks, overlain uncomformably by thick sedimentary strata of mostly Miocene and younger age. The Puente Formation and Repetto Formations contain late Miocene to early Pliocene alternating shale, sandy shale, sandstone, and minor micaceous and carbonaceous siltstone. These strata are overlain conformably by the Pico Formation, which contains late Pliocene alternating sands, sandy shales and silts. These are overlain by the Palos Verdes and San Pedro formations, both of which contain loosely consolidated Quaternary sands, gravels and silts, although these two formations contact unconformably. These strata are overlain by the Lakewood formation, containing Quaternary age clays, silts, sands and gravels.

Most sediments higher in the sequence (shallower) are nonmarine, and the youngest deposits are floodplain and river-channel deposits (alluvium) that contain semiconsolidated to unconsolidated clays, silts, sands and gravels. A generalized geologic map and cross section are presented in Figures 3.1 and 3.2.

2. Based on the geology of the region and information provided from site boring logs (Geraghty & Miller, 1996d and 1996e), the material found beneath the former ILM facility consists of unconsolidated sediments which are capped in most places by concrete or asphalt, and occasionally by discontinuous intervals of fill materials either at the surface or beneath the concrete/asphalt cap, *Ground Water Monitoring Report*, Former International Light Metals Facility, Geraghty & Miller, Inc., July 1997 (Geraghty & Miller, 1997a). The surface cap conditions are basically consistent for both the former and current operations at the site.

3. The shallow sediments at the site occur as a heterogeneous assemblage of silt, clay and sand. These sediments (excluding fill materials) can be identified in five distinctive layers, described in detail in Chapter 4.0 of the *Groundwater RCRA Facility Investigation Workplan*, January 19, 1996 (Geraghty & Miller, 1996c). A low permeability layer consisting of primarily silts and clays has been encountered from ground surface to an average depth of approximately 25.5 feet beneath the former ILM facility (the "Upper Clay/Silt Unit"). It is underlain by a relatively higher permeability layer consisting primarily of fine-grained sands and silty sands which extends to an average depth of approximately 40 to 45 feet (the "Upper Sand Unit"). Beneath the Upper Sand Unit lies a thin, discontinuous low permeability zone (the "Lower Clay/Silt Unit") which extends to an average depth of approximately 45 to 50 feet beneath the site. Beneath the "Lower Clay/Silt Unit" lies the "Lower Sand Unit", which consists of permeable sand. Within this sand, the top of the saturated zone occurs at approximately 65 to 70 feet below ground surface. Underlying this sand layer is the "First Saturated Clay (FS Clay)," a discontinuous layer beneath the former ILM facility found at depths ranging from 69 to 83 feet bgs. These layers, together with sand to depths of approximately 98 to 108 feet below ground surface (bgs), likely correspond with the Semiperched aquifer and the upper and middle portions of the Bellflower aquiclude hydrologic units as defined by the DWR. These shallow sediments are presented in the site cross section in Figures 3.3 and 3.4, and are discussed further in the following section.

3.7 HYDROGEOLOGY

3.7.1 REGIONAL HYDROGEOLOGY

1. The area around the Cities of Torrance and Santa Monica includes the Coastal Plain occurring within the southwestern block of the Los Angeles Basin. The Newport-Inglewood uplift divides the Coastal Plain into two distinct ground water basins, the Central Basin and the West Coast Basin. The former ILM facility site is located in the West Coast Basin, which is on the southwest or seaward side of the Newport-Inglewood uplift. The West Coast Basin extends from the Ballona Escarpment (Playa del Rey) and Baldwin Hills, on the northwest, to the Long Beach Plain, on the southeast. The Torrance Plain is located within the center of the West Coast Basin.

2. Ground water contained in the West Coast Basin occurs in three main water bodies. A "water body" represents a ground water system which includes one or more ground water aquifer(s) and its contained water. In descending order, these main water bodies are: (1) the "Semiperched aquifer water body"; (2) the "principal water body"' and (3) the "saline water body." Based on geologic data presented in DWR Bulletin 104 (DWR, 1961), the "Semiperched aquifer water body" includes the Semiperched aquifer hydrologic unit with depths that correlate with the "Upper Clay/Silt Unit" as defined at the site. Also, the "Upper Sand Unit," "Lower Clay/Silt Unit," "Lower Sand Unit," and "FS Clay" correlates with the upper Bellflower aquiclude. Where the upper portion of the Bellflower aquiclude lacks consistent finer grained units, as with the project site, the transition between the hydrologic units of the Semiperched aquifer and the upper Bellflower aquiclude is not as distinguishable. Below the "Lower Sand Unit" and the "FS Clay" is the lower Bellflower aquiclude. The "principal water body" consists of the Gage aquifer, and other aquifers and aquicludes above the base of the fresh water and is separated from the "Semiperched aquifer water body" by the Bellflower aquiclude." Below the "principal water body" is the "saline water body."

3. The Semiperched aquifer water body consists of shallow, unconfined, and semiperched aquifer water and is typically found in unconsolidated Quaternary sediments less than 100 feet below land surface. The Semiperched aquifer water body has been found to maximum depths of 80 to 100 feet below ground surface (bgs) within the south-central part of the Torrance Plain. In general, the Semiperched aquifer water body is of little beneficial use due to its poor water quality and yields little or no water to wells. In many areas of the West Coast Basin, ground water is not detected in sediments of the Semiperched aquifer.

4. The principal water body consists of the fresh water confined in the major aquifers found in the unconsolidated Quaternary sediments and in underlying unconsolidated and semiconsolidated Pliocene sediments. The principal water body extends downward from the base of the Semiperched aquifer water body and Bellflower aquiclude (where present) to the top of the saline water body. The principal water body reaches its maximum thickness near the intersection of Carson and Alameda streets, approximately 5 miles east-southeast of the former ILM facility site. The principal water body is extensively developed and used for water supply across the West Coast Basin.

5. The saline water body consists of saline water contained in the Pico formation and the Monterey shale below the principal water body.

3.7.1.1 Hydrologic Units

1. The majority of the hydrologic units are found in the unconsolidated sediments of Quaternary age and are of varying water quality and usage (DWR, 1961). Hydrologic units in the underlying unconsolidated and semiconsolidated sediments of Tertiary age are undifferentiated. The basement rocks are not water-bearing.

2. The Quaternary sediments contain the majority of water-bearing formations and all the principal aquifers recognized within the West Coast Basin. The hydrologic units recognized in the area of the former ILM facility site include, in descending order, the Semiperched aquifer, the Bellflower aquiclude, the Gage aquifer, the Lynwood aquifer and the Silverado aquifer (see Figures 3.2 and 3.4). Because little beneficial use is made of the Semiperched aquifer, its occurrence and extent are not well defined. Ground water in the Semiperched aquifer is believed to occur in irregular patches across the West Coast Basin. As described above, where the upper portion of the Bellflower aquiclude lacks consistent finer grained units, as with the project site, the transition between the Semiperched aquifer and the upper Bellflower aquiclude is not distinguishable and ground water is initially encountered within the Bellflower aquiclude (i.e., the Semiperched aquifer below the site does not contain ground water).

3. Both the Semiperched aquifer and the underlying Bellflower aquiclude are included within the upper portion of the Lakewood formation. Near the former ILM facility, the Lakewood formation is believed to be 200 to 250 feet thick. The Semiperched aquifer consists of sands and gravels, found on or near the surface, which can contain significant amounts of

unconfined water of relatively poor quality. During the 1950s, this aquifer was used locally for domestic or irrigation water supply near Gardena, north of the former ILM facility. Based on Bellflower aquiclude maps included in DWR Bulletin 104, the Bellflower aquiclude would be encountered at approximately 25 feet bgs, below the Semiperched aquifer hydrologic unit (DWR, 1961).

4. Previous ARCADIS G&M reports have identified the shallow water bearing unit beneath the former McDonnell-Douglas Aircraft (current BRC Property) and Montrose facilities immediately east of the former ILM facility as the Semiperched aquifer. The reports indicate the Semiperched aquifer consists of an upper and lower portion. The upper portion is unconfined and consists of sands and silty sands with occasional silt and clay interbeds. The lower portion consists of thinner beds of sand and silty sand. These same reports identify the Semiperched aquifer beneath the Mobil Oil Refinery located west of the former ILM facility. Here, the Semiperched aquifer was described as consisting of sands and silty sands and extending to a depth of about 80 feet. At 80 feet, a relatively thin silty clay horizon, approximately 5 to 10 feet thick, was found. This clay was absent near the southwest corner of the refinery.

5. Further evaluation of the shallow ground water identified at the BRC property, Montrose and Mobil Oil Refinery sites indicates this ground water correlates (e.g., ground water surface elevations and boring logs) with the ground water identified within the Bellflower aquiclude at the former ILM facility site in this GWRFI.

6. The Bellflower aquiclude includes all of the fine-grained sediments that extends from the ground surface, or from the base of the Semiperched aquifer, down to the top of the first principal aquifer below. The Bellflower aquiclude consists of a heterogeneous mixture of fine-grained continental, marine and wind-blown sediments. In the area of the former ILM facility, the Bellflower aquiclude overlies the Gage aquifer and is believed to range from about 80 to 120 feet in thickness. The elevation at the base of the aquiclude is believed to range from about 60 to 100 feet below mean sea level (msl). Regional maps suggest that throughout the former ILM facility area and extending to the north and east, the Bellflower aquiclude is composed of clay and silty clay. West and south of the former ILM facility site, the Bellflower aquiclude is composed of sandy and gravely clay. This lithologic change to sandy and gravely clay occurs approximately 2 miles west of the former ILM facility, near the center of Section 3, Township 4 south, Range 14 west; and approximately 1 mile south of

the former ILM facility, near the center of Section 3, Township 4 south, Range 14 west; and approximately 1 mile south of the former ILM facility, near the center of Section 12, Township 4 south, Range 14 west.

7. Where the Bellflower aquiclude is composed predominantly of clay and silty clay, the aquiclude is considered relatively impermeable with respect to vertical ground water flow, and is believed to hydraulically separate the Semiperched aquifer from underlying aquifers. However, the Bellflower aquiclude also contains water-saturated sand stringers ranging in thickness from several inches to several feet. Where the Bellflower aquiclude is missing within the Torrance Plain area, the shallow Semiperched aquifer is in direct hydraulic continuity with the lower Gage aquifer (DWR, 1961). Review of DWR maps (Plates 3B and 6D, DWR, 1961) indicates the Bellflower aquiclude is present below the former ILM site and several miles surrounding the site with an approximate thickness of 80 to 120 feet (DWR, 1961). This was further confirmed based on review of boring and well logs from the investigations presented in this GWRFI.

8. The Gage aquifer, formerly referred to as the "200-ft sand", is found in the lower portion of the Lakewood formation. The Gage aquifer is believed to be contemporaneous with the Gardena aquifer. In the West Coast Basin, the Gage aquifer consists of fine to medium sand with variable amounts of gravel, sand, silt and clay. Near the former ILM facility, the Gage aquifer immediately underlies the Bellflower aquiclude and is believed to be from 40 to 120 feet thick. The elevation at the base of the aquifer is found at approximately 150 feet below msl.

9. The Lynwood aquifer, formerly referred to as the "400-ft gravel", is situated within the upper portion of the San Pedro formation. In the West Coast Basin, the Lynwood aquifer consists of marine sand and gravel. Near the former ILM facility, the Lynwood aquifer is found below the Gage aquifer and is believed to be 50 to 100 feet thick. Below the site, the Lynwood aquifer may be absent (see Figure 3.2). The elevation at the base of the aquifer is found at approximately 300 feet below msl. Less permeable clays, silts, and sandy and silty clays of the San Pedro formation bound the Lynwood aquifer along top and bottom contacts. These fine-grained sediments physically and hydraulically separate the Lynwood aquifer from the overlying Gage aquifer and underlying Silverado aquifer. Beneath the Mobil Oil Refinery, approximately 1 mile west of the former ILM site, the confining layer separating the

Silverado and Lynwood aquifers pinches out, thus creating a hydraulic connection between the two aquifers. The Lynwood aquifer is considered to be an important water-producing aquifer in the West Coast Basin.

10. The Silverado aquifer, formerly referred to as the "Silverado water-bearing zone," is the most extensive aquifer in the San Pedro formation. In the West Coast Basin, the Silverado aquifer consists predominantly of sand, and sand and gravel, with few layers of silt. Near the former ILM facility site, the Silverado aquifer is found below the Lynwood aquifer and is separated from it by relatively fine-grained sediments. The Silverado aquifer is believed to be 250 to 300 feet in thickness. The elevation at the base of the aquifer is approximately 700 feet below msl. The Silverado aquifer is the major water-bearing aquifer in the West Coast Basin.

11. Aquifers are not differentiated in the deeper Tertiary sediments. However, fresh water has been found in the upper member of the Pico formation. The water-bearing portion of the Pico formation defines the base of fresh ground water within the West Coast Basin. Near the former ILM facility site, the base of fresh ground water is found at an elevation between 2,000 and 2,500 feet below msl, equivalent to a depth of between approximately 2,050 and 2,550 feet bgs. The water found in the Pico formation is of poor quality and is considered unsuitable for general use. The middle and lower members of the Pico formation and the underlying Monterey shale yield saline water.

12. The DWR estimates that sediment found above the base of the Bellflower aquiclude have a specific yield of zero percent. Specific yield is the volume of water contained in an aquifer that is released under the force of gravity.

13. Hydraulic characterization information for the shallow Semiperched aquifer in the site vicinity is sparse. Knowledge of the hydraulic conductivity of the shallow aquifer identified in previous reports as the Semiperched aquifer in the site vicinity is available based on aquifer tests performed by Woodward-Clyde Consultants, Inc. (WCC) at the former McDonnell-Douglas facility (BRC property), located immediately east of the former ILM facility (Geraghty & Miller, 1996a). WCC performed a 30-hour constant discharge aquifer test on Well WCC-4S, located approximately 1,500 feet due east of the former ILM site and screened through the upper portion of the shallow aquifer. Slug tests were also performed on eight other shallow ground water monitoring wells located at the former McDonnell-Douglas facility and screened through this aquifer. Hydraulic conductivity (K) is a coefficient describing the rate at which water can move through a permeable medium. Based upon

an analysis of the recovery data, the horizontal hydraulic conductivity derived by WCC from the WCC-4S aquifer test was 470 gallons per day per feet squared (gpd/ft^2) (2.22 x 10^{-2} cm/sec). The horizontal hydraulic conductivity values derived from the slug tests ranged from 24 to 140 gpd/ft^2 (1.13 x 10^{-3} to 6.58 x 10^{-3} cm/sec).

14. James M. Montgomery Consulting Engineers, Inc. (James M. Montgomery) prepared estimates of average hydraulic conductivity using published aquifer test results, specific capacity data, and typical values for lithology. The reported range of typical hydraulic conductivity for the Gage aquifer is 100 to 1,000 gpd/ft^2, equivalent to 4.72 x 10^{-3} to 4.72 x 10^{-2} centimeters per second (cm/sec); for the Lynwood aquifer, the range is 100 to 1,500 gpd/ft^2 (4.72 x 10^{-3} to 7.08 x 10^{-2} cm/sec); and for the Silverado aquifer the range is 100 to 1,500 gpd/ft^2 (4.72 x 10^{-3} to 7.08 x 10^{-2} cm/sec). The range of typical storativity values for each of these aquifers is 5 x 10^{-3} to 5 x 10^{-4}. Storativity is a dimensionless number that indicates the volume of water released across a unit area per aquifer thickness, under a unit drop in hydraulic head (Geraghty & Miller, 1996a).

3.7.1.2 Ground Water Recharge and Discharge

1. Regionally, the aquifers are primarily replenished with freshwater injected at two saltwater intrusion barrier projects, the West Coast Basin Injection Barrier and the Dominguez Gap Injection Barrier. The barrier injection flows are believed to account for greater than 55 percent of the total baseline inflow. The only significant source of natural replenishment, other than infiltration of precipitation and irrigation water, is from the Central Basin across the Newport-Inglewood uplift (up to 30 percent of the inflow). The Newport-Inglewood uplift serves as a partial barrier to ground water flow from the Central Basin to the West Coast Basin. Ground water flow across the Newport-Inglewood uplift is controlled by the difference in water levels between the Central Basin and the West Coast Basin and by the hydraulic conductivity across the barrier. These water levels are artificially influenced due to extractions, outflow and replenishment in both basins. However, natural replenishment in the West Coast Basin is secondary compared to artificial replenishment from the injection barrier projects (ARCADIS G&M, 1999a). Regional hydrologic features and ground water flow are shown in the map in Figure 3.5.

2. Ground water extraction accounts for approximately 90 percent of the discharge from the aquifers of the West Coast Basin. Most of the ground water pumped from the basin is extracted from the lower Lynwood and Silverado aquifers. The Semiperched aquifer,

Bellflower aquiclude and Gage aquifer contain ground water of poor quality, with high total dissolved solids content. The Semiperched aquifer unit and Bellflower aquiclude do not yield significant amounts of ground water throughout areas of the West Coast Basin, including the area below the former ILM facility site.

3.7.1.3 Ground Water Flow

1. Regional patterns of ground water flow are strongly influenced by the location of injection barriers and pumping centers across the West Coast Basin. The combined effect of injection at the West Coast Basin and Dominguez Barriers and ground water extraction from pumping centers within the basin result in a net regional east-southeast flow pattern in the vicinity of the former ILM facility site. The Carson/Dominguez area acts as a regional ground water sink, because a majority of the ground water produced from the West Coast Basin is extracted in the area between the Dominguez Gap and the Dominguez Hills. The Charnock fault and the geologic structures of the Newport-Inglewood uplift act as partial barriers to ground water flow. Regional hydrologic features and ground water flow are shown in Figure 3.5.

2. Inflows from the West Coast Basin Injection Barrier initially move to the east in a landward direction and are then deflected either toward major pumping centers encountered along the flowpath (by well capture), or to the southeast by the Charnock fault. Inflows across the Newport-Inglewood zone are controlled by regional structures and are deflected parallel to the faults. Inflows from the Dominguez Gap Injection Barrier initially move in a northerly direction and are then deflected northeast to the Carson/Dominguez area.

3.7.1.4 Offsite Ground Water Well Survey

1. A water well survey, performed in 1995 and updated in 1998 by ARCADIS G&M and in 1999 by TRC, did not identify active ground water supply wells located within a 0.5-mile radius of the former ILM facility site. There are several wells which are reported to exist within a 0.5-mile radius of the site, however, many of these wells are associated with environmental remediation activities (e.g., Montrose, Allied Signal and Mobil) or are domestic or irrigation wells that have been abandoned, destroyed or are not used. Ground water from the Gage aquifer is extracted and treated at the Mobil site located approximately 2,500 feet west of the former ILM site. Five additional wells for which data was not available are located within

0.5-mile of the site. These wells are located northwest or northeast of the site in the upgradient/sidegradient direction. The results of the offsite well survey data are summarized in two tables and one figure included in Appendix A.

2. In addition to the wells described above, the water well survey identified 25 active water supply wells within a 2-mile radius of the site. Only two of these wells are located south or southeast of the site (i.e., in the downgradient direction). One is owned by General Petroleum Co. (251 feet deep) and the other is owned by the Dominguez Water Corp. (1,701 feet deep) and has not been used since 1963. Based on well construction information available, both are completed below the Bellflower aquiclude (ARCADIS G&M, 1999c).

3.7.2 SITE HYDROGEOLOGY

1. Regional and local hydrogeologic data suggest that one semiperched aquifer, one major aquiclude and three principal aquifers occur below the former ILM facility and immediate surrounding area. In descending order, they are the Semiperched aquifer, the Bellflower aquiclude, the Gage aquifer, the Lynwood aquifer, and the Silverado aquifer. The characteristics of the shallower units (the Semiperched aquifer and the Bellflower aquiclude) have been identified in the numerous onsite and offsite ground water well boring logs (see boring logs in Appendix B). It appears that the two deep soil borings drilled during the SRFI activities to characterize shallow soils identified the contact between the Bellflower aquiclude and the Gage aquifer (e.g., Deep Borings DB-1 and DB-2; boring logs are also included in Appendix B).

2. The following sections present a summary of site ground water conditions based on hydrogeologic data collected during this GWRFI. Hydrogeologic data is presented in Chapter 4.0 along with graphical presentations of ground water elevations, flow directions and trends.

3.7.2.1 Ground Water Occurrence

1. The first occurrence of ground water underlying the former ILM facility is found at approximately 65 feet bgs within a unit termed the "Lower Sand." This "Lower Sand" unit has been defined in previous ILM reports as being within the Bellflower aquiclude and appears to correlate with ground water defined as being with the Semiperched aquifer at surrounding sites (refer to Section 3.7.1). Further review of previous reports indicate others

may have presented the Semiperched aquifer as being within the Bellflower aquiclude, whereas the DWR Bulletin 104 interprets them as separate units. Based on available information, the first occurrence of ground water underlying the former ILM facility is within the Bellflower aquiclude.

3.7.2.2 Ground Water Recharge and Discharge

1. Currently a majority of the site (approximately 80 percent) is covered by warehouse buildings and is paved, with smaller landscaped areas located along the buildings, property lines and planter areas adjacent to parking areas and driveways. The northern portion of the site (approximately 20 percent) is currently under development. The potential recharge to the shallow water bearing zone within the Bellflower aquiclude from the current remaining unpaved areas of the former ILM site is minimal and will be reduced further with the completion of the development in the northern portion of the site.

2. Several historical, former onsite sources of potential recharge to the shallow water bearing zone within the Bellflower aquiclude were identified. A former retention basin was situated near the outfall to the surface water drainage system in the northeast corner of the site. A 150,000-gallon reinforced concrete fire suppression storage reservoir was located beneath the former south foundry. One dry well was located outside the former Carpenter Shop near the east-central property boundary. A second dry well may have also been located in the south half of the former facility. The historical rate of potential recharge from these former sources was unknown. These potential sources of recharge were removed (demolished) in 1994.

3. Currently, a majority of ground water recharge and discharge at the site is likely from subsurface inflow and outflow across the projected property lines of the site. Since 1994, the site has had a net recharge resulting in water levels rising an average of 3 feet in the Bellflower aquiclude. (The former ILM facility is located just within an area identified as an "area of rising water levels." The rising levels are a result of the addition of freshwater along the two main injection barriers; the West Coast Basin Barrier and the Dominguez Gap Barrier [State of California Department of Water Resources, Water Master Service in the West Coast Basin, Los Angeles County, September 1999]).

3.7.2.3 Ground Water Conditions

1. Ground water elevations recorded at the former ILM facility during July 1999 ranged from approximately 8 to 14 feet below mean sea level (approximately 63 to 69 feet below ground surface). Ground water levels have been rising in the former ILM facility wells, and hydrographs indicate an average increase of approximately 3 feet (see Section 3.7.2.2).

2. The ground water flow direction is generally to the east-southeast at an average hydraulic gradient of 0.003 ft/ft (July 1999). However, variability in the ground water flow direction and gradient exists on the site. In the western portion of the site, the ground water flow direction is to the east. The ground water flow direction transitions to the south going from west to east across the site. This change in flow direction occurs in the northwest corner of the site and trends through the central portion of the site. This transition creates a ground water trough in the piezometric surface in this area.

3. Ground water appears to be mounding in the area around Well P-2, near the northwest corner of the site. The mounding at Well P-2 is likely influenced by the FS Clay layer, which is approximately 2 to 4 feet higher in Well P-2 than encountered in surrounding wells (i.e., P-3, P-9, P-9B, P-11, P-12, P-23 and P-24). This clay layer was encountered just below the piezometric surface, thus likely has an influence on the ground water elevation.

4. Based on aquifer tests performed by WCC east of the site, the hydraulic conductivity of the shallow water bearing zone ranged from 1.13×10^{-3} cm/sec (3.20 ft/day) to 2.22×10^{-2} cm/sec (62.83 ft/day) (see Section 3.7.1.1). This is consistent with laboratory hydraulic conductivity measurements of samples collected onsite from the sand zone above the water table during SRFI activities (e.g., 1.16×10^{-2} cm/sec) (Geraghty & Miller, 1996a). Therefore, the ground water velocity (based on the equation: velocity equals the hydraulic conductivity multiplied by the gradient, and the product divided by the effective porosity) would be estimated from 0.023 ft/day (or 8.55 ft/yr) to 0.46 ft/day (or 167.80 ft/yr) (assumes an average current gradient of 0.003 ft/ft and an average porosity of 41 percent based on site data.) This is considered a slow rate of ground water movement.

5. In addition to a slow lateral rate of ground water movement, the hydrologic and historic VOC concentration data indicate that the vertical gradient between the upper and lower ground water within the shallow water bearing zone at the site, defined as being within the Bellflower aquiclude, is minimal. Based on the March and July 1999 water elevations in Wells P-16A and P-16C (see Chapter 4.0) and the difference in the bottom depth of Wells P-16A and P-16C

(32 ft), the potential vertical gradient is estimated at 0.003 to 0.004 ft/ft. Also, TCE concentrations in Well P-16C, which is screened at a lower zone in the ground water, have remained relatively unchanged over approximately three years, while the TCE concentrations in adjacent Well P-16A, which is screened in the upper zone, have decreased almost 90 percent, indicating little downward vertical migration.

3.8 SURROUNDING AREA CONTAMINATION

1. Ground water contamination from offsite source areas has been previously reported. These sources have been identified from public record reviews and from previous ARCADIS G&M reports. These sources include but are not limited to the BRC Property, Trico Industries, Montrose Chemical, and the Mobil Oil Refinery (see Figure 2.2). Facility names identified are used to provide the location of the site relative to the former ILM facility and are not listed to assign or reflect responsibility for known contamination. The regional ground water gradient for this area reflects a general ground water flow to the southeast.

2. Surrounding source areas include known ground water contamination from VOCs, SVOCs, metals, pesticides, PCBs, cyanide and TPHs.

3. Dissolved contaminants that have been monitored as part of the Montrose and Del Amo ground water RCRA Investigations (areas to the east and south of the site) include VOCs, SVOCs, metals, PCBs and cyanide. Contaminant concentrations exceeding the maximum contaminant levels (MCLs) or other regulatory standards include chlorobenzene, benzene, TCE, PCE and others.

4. The Mobil Oil Refinery, located approximately 1/2 mile west of the site, conducted ground water sampling in 1998 and analytical results indicate benzene, toluene, ethylbenzene, xylenes (BTEX) and VOC contamination in ground water.

5. The BRC property and Trico Industries, along with three other sites in the greater surrounding area (Penske Truck Leasing, Allied Signal and the Gardena Valley Landfill) have documented VOC ground water contamination. The contaminants include TCE, PCE, 1,1-DCE, 1,1-DCA, benzene, toluene, 1,1,1-TCA and vinyl chloride.

6. The locations of current and former sites with significant impacts along with the former ILM site are shown in the aerial photograph in Figure 2.2.